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How consistent and effective are current repositioning strategies for pressure ulcer prevention?

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ABSTRACT

Aim: To examine the inter-practitioner variability of repositioning for pressure ulcer prevention, the effectiveness of the intervention, and whether the provision of written guidance influenced the repositioning technique.
Methods: A pre-test post-test study design was utilised. Descriptive data regarding the work history of participants was collected. Participants were invited to reposition a healthy volunteer before and after reviewing guidance detailing the 30° side-lying technique. The researchers measured the resulting turn angles and assessed offloading of bony prominences.
Results: The repositioning technique varied considerably in the sample of nurse participants. Turn angles decreased following the guidance, but offloading of body sites vulnerable to pressure damage remained sporadic.
Conclusion: Pressure ulcer prevention training should include practical demonstrations of repositioning. Clear guidance regarding the optimal repositioning technique for pressure ulcer prevention is needed.

1. Background

Pressure ulcers (PUs) have a significant impact on the quality of life of those affected, causing pain, physical restrictions and social isolation (Gorecki et al., 2009). The treatment of PUs places a considerable burden on the NHS, with costs per ulcer amounting to as much as £14,108 for severe ulcers (Dealey, Posnett, & Walker, 2012). PU development is considered indicative of the quality of care provided (Bail & Grealish, 2016; Department of Health, 2010), and their prevention has been identified as one of the High Impact Actions for Nursing and Midwifery (NHS Institute for Innovation and Improvement, 2009).

Individuals who are unable to move independently are predisposed to PUs if they are subjected to sustained static postures (Woodhouse, Worsley, Voegeli, Schoonhoven, & Bader, 2015). Accordingly, guidelines recommend that healthcare professionals implement repositioning regimes (National Institute for Health and Care Excellence, 2014; NPUAP, EPUAP and PPPIA, 2014). Currently the 30° side-lying position is the preferred technique to reposition individuals that are bedbound (NPUAP, EPUAP and PPPIA, 2014). This position aims to redistribute pressure to the supporting soft tissues while facilitating offloading of bony prominences, such as the sacrum and heels. A recent finite element modelling study which examined sacral soft tissue strains at turn angles ranging from 0 to 45°, suggests that a 20–30° angle results in an optimal value, producing the lowest internal tissue strains (Oomens, Broek, Hemmes, & Bader, 2016).

Moore, Cowman, and Conroy (2011) reported that in a RCT of hospitalised patients the 30° side-lying position yielded a reduced PU incidence when compared to the traditional 90° lateral position. A secondary analysis of these data further revealed that the 30° side-lying position was less time consuming, resulting in estimated cost savings of €46 per patient over the study period (Moore, Cowman, & Posnett, 2013). Nevertheless, a review of these and other repositioning studies concluded that there is a paucity of robust research supporting the use of the 30° side-lying position, the optimal frequency of repositioning, and its cost effectiveness. However, the authors reaffirm that a sound physiological rationale underlies the use of this intervention (Gillespie et al., 2014).

Despite its widespread adoption, the inter-practitioner variability of the 30° side-lying position has not been examined. Therefore, this study was designed to examine whether:

- practitioners adopted a reproducible repositioning technique;
- offloading of vulnerable areas was achieved;
- written guidance on the 30° side-lying technique proved effective.

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2. Methods

2.1. Study design and sample

A pre-test post-test study design was utilised. Approval was granted by the Faculty Ethics Committee of the University of Southampton (FoHS-ETHICS-14219). Registered nurses, healthcare support workers and student nurses were eligible to participate in the study providing they had clinical experience of repositioning for pressure ulcer prevention, and could safely perform the repositioning manoeuvre.

2.2. Instruments and procedure

Following written consent, participants were asked to complete a survey detailing their years of experience, Agenda for Change (AfC) band, work setting and speciality, the frequency in which they undertook repositioning in their current role, and the extent of their training on PU prevention.

Participants were then invited to reposition a single healthy male volunteer (aged 29, BMI 23 kg/m^2) from a supine to a left tilt position, using the technique they would routinely use in clinical practice for pressure ulcer prevention. A viscoelastic mattress (Model NP150, Hill-Rom, Ashby, UK) formed the support surface, which was placed on a profiling bed. A range of pillows were made available to each participant, varying in firmness, to utilise as per their individual clinical judgment. There was no time restriction on performing the manoeuvre and participants were instructed to alert the researchers once they felt the position of the volunteer was optimal. Following this, participants reviewed written guidance that described and illustrated the 30° side-lying position (Wilson, 2008) behind a screened area of the test laboratory.

In the meantime, two nurse researchers independently measured turn angles using a handheld inclinometer device with a 0.5° resolution (Model 1700, SOAR, Digital Level Meter). These measurements were performed at the levels of the sternum, pelvis, and ankle by locating the device centrally over the volunteer. In addition, the researchers assessed whether the heels and sacrum were free from contact with the mattress. However, after the first data collection session it became apparent that this did not necessarily result in complete offloading of these body areas. Accordingly, a distinction was made between the body sites being free from contact with the support surface and complete offloading in subsequent data collection sessions. An item assessing offloading of the malleoli was also included. The sequence in which the researchers completed their assessments was randomised. Photographs of the volunteer position were obtained by a single researcher throughout the data collection sessions. Once this process was complete and the participant had reviewed the guidance surrounding the 30° side-lying position, the pillows were removed and the participant was invited to repeat the manoeuvre, after which all previously detailed assessments were repeated.

2.3. Data analysis

Inclinometer data were analysed with IBM SPSS Statistics (Version 22, USA). The inter-rater reliability of these data were estimated using intraclass correlation coefficients (ICCs), based on a single measures, absolute agreement, two-way random effects model (Hallgren, 2012; Shrout & Fleiss, 1979). Resulting ICC estimates ranged from 0.76 to 0.98 over the 6 conditions (3 measurement sites, each measured twice) indicating excellent inter-rater reliability (Cicchetti, 1994). Wilcoxon matched-pairs signed-ranks tests or sign tests were utilised to assess statistical significance between the inclinometer data that were obtained by the single researcher prior to (pre-test) and after (post-test) guidance (Altman, 1999; Pett, 1997).

The overall percentage agreement was computed for the physical assessment items, with agreement between the researchers found to range from 50 to 100%. The pre-and post-test physical assessment data which were collected by single researcher were compared with McNemar tests (Pett, 1997). A p-value ≤ 0.05 was considered statistically significant.

3. Results

3.1. Participant characteristics

Twelve participants consented to take part in the study. All but one of these participants were registered nurses, most of whom were employed in secondary care, with a median work experience of 6 years (range 1–36 years). Of these nurses, 64% were employed at AfC band 5, while band 6 and 7 nurses comprised 27% and 9% of the group, respectively. The remaining participant was a second-year student nurse, who most recently had attended a primary care practice placement. Nine of the participants undertook repositioning for PU prevention on at least a weekly basis. All participants had received PU prevention training in the last 5 years and 83% reported that this training included instruction on repositioning.

3.2. Volunteer assessment findings

The pre- and post-test turn angles for each of the 3 body sites are illustrated in Fig. 1. Compared to the pre-test data, the median and range of turn angles decreased at every measurement site following guidance surrounding the 30° side-lying position, and these differences yielded statistically significant results at the sternum and the ankles ($p \leq 0.05$).

It is interesting to note that the sternal angles were frequently lower than the associated pelvic angles during both test conditions, resulting in median angles of 28° (pre-test) and 24° (post-test) for the former, and 38° (pre-test) and 30° (post-test) for the latter site (Fig. 1). Indeed, in 3 of the pre-test cases this difference between the sternum and pelvis was ≥14°, indicating a substantial postural misalignment of the volunteer.

When comparing the three sites, the greatest range of turn angles was observed at the ankles, both before and after guidance (Fig. 1). This variation was equally evident from the photographs, which illustrated the range of techniques employed by participants when positioning the legs and feet of the volunteer (Fig. 2A & B). Nevertheless, the majority

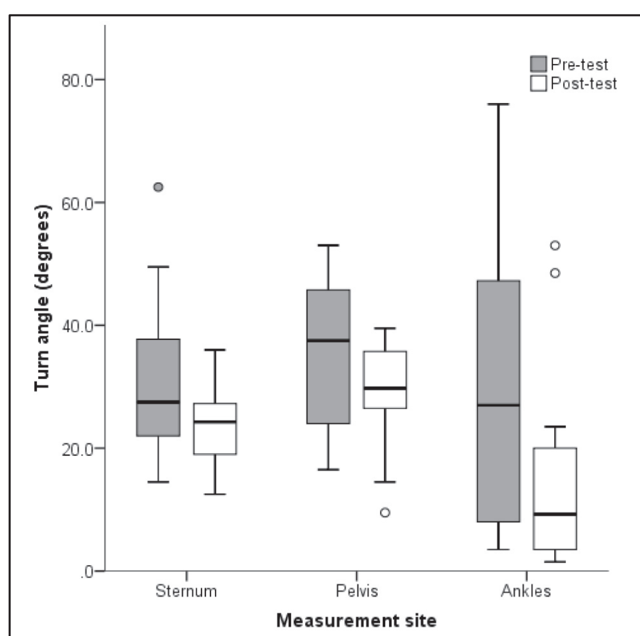

Fig. 1. Pre- and post-test turn angles (degrees) at the three measurement sites.

Fig. 2. A: Observed variability in the pre-test repositioning technique of four participants (F, J, K and L). All of these participants were staff nurses who undertook repositioning on a daily basis and had received instruction on repositioning in the previous 5 years. B: The corresponding post-test repositioning technique of the four participants.

of participants altered their technique following guidance, as can be observed in the post-test photographs (Fig. 2B).

This change in technique was accompanied by an improvement in the number of cases where the heels were deemed free from contact with the support surface (Table 1). Complete offloading of the heels improved marginally, with this occurring in 3 pre-test against 4 post-test assessments. While offloading of the malleoli was not observed during any of the pre-test assessments, this was achieved in 3 of the post-test assessments.

By contrast, both of the features associated with the sacral site deteriorated following written guidance (Table 1). Thus the sacrum was free from contact with the mattress in 8 pre-test assessments, as compared to 5 post-test assessments. Similarly, sacral offloading occurred in 4 and 2 pre- and post-test assessments, respectively. These differences, however, were not statistically significant in any of the five assessment features (all $p > 0.05$).

4. Discussion

Our results have revealed a considerable variability in the repositioning technique of participants, all of whom had clinical experience of repositioning and had attended relatively recent training in PU prevention. The provision of written guidance was found to influence practitioners' repositioning technique, as evidenced by lower turn angles at two of the three body sites. However, this did not result in a substantial improvement in the number of cases where offloading of vulnerable body sites was observed, and proved to be detrimental to the sacral assessment parameters. A potential explanation for this unpredicted finding is that practitioners focused on emulating the position illustrated within the guidance, while overlooking the written instructions regarding offloading of bony prominences. Indeed, research investigating learning styles has indicated that nurses exhibit a preference for the use of visual displays, as well as kinaesthetic learning activities (Frankel, 2009). Nevertheless, comparison of the independently conducted assessments of two researchers suggests that establishing whether a body site is offloaded is not simple as may be anticipated. This has practical implications since assessing clearance between the body and the support surface has been advocated as a means to evaluate whether a patient has been positioned correctly (Defloor, 2000; Moore & Van Etten, 2014; Preston, 1988; Seiler, Allen, & Stähelin, 1986).

Previous studies have reported challenges in maintaining the 30° side-lying position (Vanderwee, Grypdonck, De Bacquer, & Defloor, 2007; Young, 2004). A misalignment of the sternum in relation to the pelvis was frequently observed in the present study, resulting in an unstable position (Pope, 2007), thereby providing context to such research. It must be recognised that the present results were obtained during controlled lab-based conditions involving a single healthy volunteer and a small sample of participants, most of whom were registered nurses. However, these conditions are unlikely to have contributed to the inter-practitioner variation in repositioning technique. Indeed, a greater variability is likely to be found in clinical practice, where a variety of individual and medical factors, such as pain, breathlessness, and contractures, impact on the manner in which individuals are repositioned (Greenwood & Mcginnis, 2016).

The observed variability in the present study indicates that nurses are unfamiliar with the procedural aspects of the 30° side-lying position, which is consistent with previous research (Victor, 2013). However, in examining the literature surrounding this position a disparity is equally evident, particularly surrounding optimal positioning of the

Table 1
Cross-tabulation of pre- and post-test physical assessment results, obtained by one of the researchers. The parameters of interest, namely those instances where an improvement was noted are highlighted in green, while the instances where a deterioration occurred are shown in red.

Are both heels free from contact with the mattress?				
		Post-test		
		Yes	No	**Total**
Pre-test	Yes	5	–	5
	No	5	2	7
	Total	10	2	**12**
Are both heels offloaded?				
		Post-test		
		Yes	No	**Total**
Pre-test	Yes	2	1	3
	No	2	6	8
	Total	4	7	**11**
Are the malleoli offloaded?				
		Post-test		
		Yes	No	**Total**
Pre-test	Yes	-	–	–
	No	3	8	11
	Total	3	8	**11**
Is the sacrum free from contact with the mattress?				
		Post-test		
		Yes	No	**Total**
Pre-test	Yes	4	4	8
	No	1	3	4
	Total	5	7	**12**
Is the sacrum offloaded?				
		Post-test		
		Yes	No	**Total**
Pre-test	Yes	2	2	4
	No	–	7	7
	Total	2	9	**11**

legs and feet. Two distinct techniques are advocated, namely positioning with the legs rotated outwards with a pillow placed between the flexed knees (Källman et al., 2013; NPUAP, EPUAP and PPPIA, 2014; Seiler et al., 1986), and a lesser degree of rotation of the legs, both of which are supported by lengthwise placed pillows (Moore et al., 2011; Wilson, 2008). With regards to achieving pressure relief at the heels, the guideline recommendation of floating the heels is inconsistent with the position illustrated in these guidelines (NPUAP, EPUAP and PPPIA, 2014). It is interesting to note that some nurses attempted to address this in the current study by placing a pillow beneath the leg that would otherwise be in contact with the mattress (Fig. 2A, participant F and J).

Further observational research within clinical practice is required to understand the way in which nursing staff utilise the 30° side-lying position. Observational studies to date have largely focused on the repositioning frequency (Chaboyer, Mills, Roberts, & Latimer, 2013; Latimer, Chaboyer, & Gillespie, 2015), or physical parameters to assess the effects of repositioning (Peterson, Gravenstein, Schwab, Van Oostrom, & Caruso, 2013), as opposed to the technique per se. Nonetheless, the present research has highlighted the need for unambiguous guidance surrounding the preferred repositioning technique, and has identified a requirement for staff training that involves a demonstration of the procedural aspects of repositioning individuals for PU prevention and includes opportunities to practice this skill.

5. Conclusion

Pressure ulcers represent debilitating condition for immobile individuals. Advocated prevention strategies include regular repositioning in the form of the 30° side-lying position for individuals who are confined to bed. To our knowledge this is the first study to examine the reproducibility of this intervention. It demonstrated that the technique utilised by participants varied considerably and offloading of vulnerable body sites was frequently not achieved, even after the provision of written guidance.

Declaration of Competing Interest

None.

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